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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 21 June 2001 (21.06.01)	
International application No. PCT/GB00/03703	Applicant's or agent's file reference PA3468PCTINT
International filing date (day/month/year) 27 September 2000 (27.09.00)	Priority date (day/month/year) 02 October 1999 (02.10.99)
Applicant DEAR, Aiden, Robert et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

06 April 2001 (06.04.01)

☐ in a notice effecting later election filed with the International Bureau on:
2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Olivia TEFY Telephone No.: (41-22) 338.83.38
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REC'D 15 JAN 2002

WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PA3468PCTINT	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) FOR FURTHER ACTION	
International application No. PCT/GB00/03703	International filing date (day/month/year) 27/09/2000	Priority date (day/month/year) 02/10/1999
International Patent Classification (IPC) or national classification and IPC B21J15/26		
Applicant TEXTRON FASTENING SYSTEMS LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 06/04/2001	Date of completion of this report 11.01.2002
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Ritter, F Telephone No. +49 89 2399 2387 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03703

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-6 as originally filed

Claims, No.:

1-9 with telefax of 10/12/2001

Drawings, sheets:

1/5-5/5 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03703

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-9
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-9
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-9
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

D1: DE-U-296 00 615

D2: WO-A-99/65630

2. Independent claim 1:

Document D1, which is considered to represent the closest prior art, discloses:

A hand-held (Handgerät, see e.g. page 3, last paragraph) riveting tool (page 4, third paragraph, line 4) driven by a battery-powered (page 3, fourth paragraph, lines 3-4) electric motor (page 4, fifth paragraph, line 1), comprising a hydraulically-actuated riveting head (fig. 2), and a hydraulic pump (18) driven by the electric motor (page 4, fifth paragraph, lines 1-5), whereby when the motor is operated it drives the hydraulic pump to actuate the riveting head (page 4, last paragraph-page 5, third paragraph), the tool including a tool-actuating device such as a trigger (Druckschalter 16), and also including a reservoir for hydraulic fluid (implicitly disclosed, since every hydraulic pump requires the provision of a hydraulic reservoir).

The subject-matter of claim 1 differs from D1 in that:

the hydraulic supply line from the pump to the riveting head is connected to the reservoir by a reservoir inlet valve which is normally open to allow hydraulic fluid to flow from the supply line into the reservoir, in which operation of the tool-actuating device firstly closes the reservoir inlet valve, and then switches on the electric motor to operate the pump.

The technical effect achieved by these distinguishing features consists in preventing the hydraulic fluid to flow back into the reservoir during operation of the pump, whereby a fast building-up of the operating pressure in the riveting head is obtained.

None of the prior art documents gives a lead to perform the combination of features according to claim 1.

The subject-matter of claim 1 is considered to be new and inventive (Article 33(2) and 33(3) PCT).

3. Dependent claims 2 to 9:

Dependent claims 2 to 9 show further embodiments of the riveting tool according to claim 1, their subject-matter is therefore also considered to be new and inventive (Article 33(2) and 33(3) PCT).

4. Document D2:

Document D2 has been filed before, but published after the priority date of the application. If the claimed priority of the application were not valid, then document D2 would be novelty destroying for the subject-matter of claims 1, 2, 5, 6 and 7 (see fig. 2 and page 8, lines 16-34). In case that the applicant enters into the Regional Phase before the EPO, the content of European Patent Application EP1089839, which is based on document D2, would be considered as comprised in the state of the art according to Article 54(3) EPC and would also be novelty destroying for the subject-matter of claims 1, 2, 5, 6 and 7.

Re Item VII

Certain defects in the international application

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

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CLAIMS

1. A hand-held riveting tool driven by a battery-powered electric motor,
5 comprising a hydraulically-actuated riveting head, and a hydraulic pump
driven by the electric motor, whereby when the motor is operated it drives the
hydraulic pump to actuate the riveting head, the tool including a tool-
actuating device such as a trigger, and also including a reservoir for hydraulic
fluid, the hydraulic supply line from the pump to the riveting head being
10 connected to the reservoir by a reservoir inlet valve which is normally open
to allow hydraulic fluid to flow from the supply line into the reservoir, in
which operation of the tool-actuating device firstly closes the reservoir inlet
valve, and then switches on the electric motor to operate the pump.
2. A riveting tool as claimed in claim 1, in which release of the tool-actuating
15 device firstly switches off the electric motor to stop operation of the pump,
and then opens the reservoir inlet valve.
3. A riveting tool as claimed in claim 1 or claim 2, in which the reservoir inlet
valve when closed by operation of the tool-actuating device as aforesaid also
acts as a pressure-relief valve to relieve over-pressure of hydraulic fluid.
- 20 4. A riveting tool as claimed in claim 3 in which the reservoir inlet valve is
urged closed by a first spring with a first predetermined force and is urged
open by a second spring with a second predetermined force, operation of the
tool-actuating device removing the action of the second predetermined force,
whereby the valve is thereafter held closed by the first predetermined force

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regardless of sustained operation of the tool-actuating device, thereby to provide a predetermined pressure at which the valve acts as a pressure relief valve as aforesaid.

- 5 5. A riveting tool as claimed in any of the preceding claims in which the riveting head is adapted to place blind breakstem rivets.
6. A riveting tool as claimed in any of the preceding claims, in which after the motor has been operated to actuate the riveting head as aforesaid and is then switched off, the riveting head is returned to its initial position by means independent of the head actuating means.
- 10 7. A riveting tool as claimed in claim 6, in which the head is returned to its initial position by means of a spring.
8. A riveting tool as claimed in any of the preceding claims, in which the electric motor, in use, rotates in only one direction.
- 15 9. A riveting tool as claimed in any of the preceding claims, in which the hydraulic pump is a reciprocating pump.

PATENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PA3468PCTINT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 03703	International filing date (day/month/year) 27/09/2000	(Earliest) Priority Date (day/month/year) 02/10/1999
Applicant TEXTRON FASTENING SYSTEMS LIMITED		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the title,

the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the abstract,

the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.1

as suggested by the applicant.



None of the figures.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International Application No

P B 00/03703

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B21J15/26 B21J15/20 B21J15/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B21J B25F B25C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 296 00 615 U (ECKOLD GMBH & CO KG) 24 October 1996 (1996-10-24) page 3, line 2 -page 5, line 12; figure 2	1,7,8
X,P	WO 99 65630 A (JOUX JEAN CLAUDE) 23 December 1999 (1999-12-23) page 8, line 16-34; figure 2	1,2,6
A	FR 2 582 561 A (COURTOIS ALAIN) 5 December 1986 (1986-12-05) page 2, line 18 -page 3, line 25; figure 2	9,10



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- * & * document member of the same patent family

Date of the actual completion of the international search

11 December 2000

Date of mailing of the international search report

19/12/2000

Name and mailing address of the ISA

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Authorized officer

Marc Augé

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 00/03703

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 29600615 U	24-10-1996	NONE	
WO 9965630 A	23-12-1999	FR 2779670 A AU 3713899 A	17-12-1999 05-01-2000
FR 2582561 A	05-12-1986	NONE	

RIVETING APPARATUS

The present invention relates to riveting apparatus, and more particularly to hand-held riveting apparatus of the type in which is driven by a battery-powered electric motor.

One such form of apparatus is described in US 5 473 805. This is a tool for riveting by means of blind breakstem rivets of the well-known type in which the rivet is placed by pulling a breakable stem with respect to a tubular body. The pulling head includes a reciprocable element, which is permanently connected to the electric motor by means of a mechanical gearbox, the electric motor being reversible in order to reverse the movement of the reciprocable element. Riveting tools according to US 5 473 805 have found acceptance in industry, but however they have the disadvantage of being relatively inefficient.

The present invention aims to allow the design and construction of riveting apparatus which is more efficient.

The invention provides, in one of its aspects, a hand-held riveting tool as defined in claim 1 of the appended claims. Further features of the invention are defined in the various sub-claims.

A specific embodiment of the invention will be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a section through a hand-held battery-powered breakstem blind riveting tool;

Figure 2 is an enlargement of part of Figure 1;

Figure 3 is a view on the line III of Figure 1;

Figures 4A, 4B and 4C show progressive positions of the reservoir inlet valve;

Figure 5 is an enlarged, partly sectional, view in the direction of the arrow V in Figure 1; and

5 Figure 6 is a schematic block diagram of the hydraulic circuitry of the tool.

The hand-held tool of this example is conventional in its general layout. It includes a breakstem riveting head 11 with an annular nosetip anvil 12 for supporting the shell head of a blind breakstem rivet (such as that available in many countries under the Registered Trade Mark AVEX), the protruding stem of which is gripped by
10 reciprocable jaws (not shown) carried by the forward end of a reciprocable drawbar 13. The rear end of the drawbar is connected to a head piston 14 reciprocable in a hydraulic cylinder 15. The piston 14 is actuated to place a rivet by supplying hydraulic fluid under pressure to the cylinder space 16 in front of the piston. After placing of a rivet the piston is returned forwardly by a spring 17. A suitable
15 receptacle (not shown) may be attached to the rear end 21 of the head, to receive broken-off parts of rivet stems. The operation of the riveting head 11 is conventional.

The tool includes a reciprocating hydraulic pump 22 and a reservoir 23 for hydraulic fluid. The pump is operated by an eccentric cam 24, which is rotated,
20 through a reduction gearbox 25, by means of an electric motor 26. When the pump is operated it draws hydraulic fluid from the reservoir 23 through an inlet non-return valve 27, and supplies hydraulic fluid to the riveting head 11 through an outlet non-return valve 28. A further trigger-operated reservoir inlet valve 29 is also connected,

as shown in Figure 6, between the outlet side of the outlet non-return valve 28 and the reservoir 23.

The reservoir inlet valve 29 is normally open so that it allows hydraulic fluid to flow from the head space 16, to the reservoir 23. The valve 29 is closed by
5 actuation of a trigger 31 which is pivoted at 32 to the body of the tool, and carries a pair of projections 33 which contact the valve 29 in order to actuate it.

Mounted adjacent the trigger-operated valve 29 is an electrical switch 34 (Figure 4), which is connected by means of electrical wiring (not shown) to actuate a relay 35 to connect a battery 36, housed at the bottom end of the pistol grip 18, to
10 actuate the motor 26 to drive the pump 22.

The arrangement of the trigger 31, valve 29 and switch 34 is such that, when the trigger 31 is progressively depressed by progressively increasing force from the finger of an operator grasping the pistol grip 18, firstly the valve 29 is closed, thereby preventing flow of hydraulic fluid into the reservoir 23, and thereafter the
15 switch 34 is closed, thereby starting the electric motor 26 and the pump 22. When the trigger 31 is released, firstly the switch 34 opens to shut off the electric motor 26 and pump 22, and thereafter the valve 29 is opened. Moreover, it is arranged that during the time when the valve 29 is closed as just described, nonetheless it can still operate as a pressure relief valve to relieve into the reservoir any dangerously high
20 pressure of hydraulic fluid which may build up. As previously mentioned, the switch 34 is mounted adjacent the valve 29, so that the actuating button 37 of the switch (see Figure 4) is actuated by a moving part of the valve 29 which is moved by operation of the trigger 31.

Figure 4 shows the construction and operation of the valve 29. It comprises a generally cylindrical tubular body 38 in which can reciprocate a generally cylindrical valve member 39. In the top end wall 41 of the valve body 38 is a circular inlet port 42, which can be closed by means of a conical projection 43 at the top of the valve member 39. When the inlet port 42 is open it communicates with a lateral outlet 44 to allow hydraulic fluid into the reservoir 23. Around the lower part of the valve member 39 is a sleeve 45, the lower end of which protrudes from the valve body 38 and bears against a washer 46 held on to the lower end of the valve member 39 by a circlip 47. The lower end of the sleeve 45 is enlarged into a flange 51 which has a transverse extension in the form of a lug 52 (Figure 5). The trigger projections 33 contact the underside of the sleeve flange 51, and the projecting lug 52 is aligned under the switch 34 so that the lug can contact the switch button 37 to actuate the switch, as will be described later.

The valve member 39 is urged upwardly into the closed position by means of a first helical spring 48 acting between the valve body 29 and the upper end of the valve member 39. It is urged downwardly into the open position by means of a second helical spring 49, acting between the valve body 29 and the sleeve 45, and thereby through the washer 46 and circlip 47 on the valve member 39.

The two springs 48 & 49 are identical, so that the valve member 39 is normally held "floating" in the open position, as shown in Figure 4A. Figures 4A, 4B and 4C are aligned vertically with each other to illustrate the relative positions of the sleeve 45, valve member 39 and trigger 31 at different stages in the progressive operation of the trigger 31. Figure 4 also illustrates the relative vertical alignment

(but not the horizontal alignment) of the switch 34 and its button 37. Figure 4A shows the position with the trigger 31 not operated, i.e. in its rest position; the sleeve 45 is held in its lowest position by the second spring 49, and the valve member 39 is in its lowest or open position, as explained above, and the switch 34 is not actuated, i.e. it is in its "off" position.

When the operator actuates the trigger by applying a progressively increasing force to it, the projections 33 bear on the flange 51 of the sleeve 45, to push it upwards, thus progressively compressing the second spring 49 and allowing the first spring 48 to progressively push the valve member upwards, towards its closed position. Figure 4B illustrates the valve member 39 in its fully closed position, with the conical projection 43 sealing the inlet part 42 under the urging of the first spring 47. The switch 34 is still not actuated, i.e. it is still in its "off" position.

As the operator applies still more force to the trigger 31, the projections 33 apply more force to the bottom of the sleeve 45, and lifts the sleeve 45 out of contact with the washer 46, whilst compressing the second spring 49 even further. When the sleeve 45 has left contact with the washer 46, the second spring 49 no longer has any effect in reducing the closing force exerted by the first spring 48 on the valve member 39. Hence the closing force on the valve is a predetermined known value, so that the valve will operate as a pressure relief valve at a predetermined over-pressure of the hydraulic fluid. This will allow hydraulic fluid to be safely returned to the reservoir 23, regardless of sustained operation of the tool –actuating device, i.e. if the operator keeps the trigger 31 depressed for a long time so that the head piston 14 contacts the cylinder cap.

As the sleeve 49 continues to rise in this way, its projecting lug 52 actuates the button 37 of the switch 34. This starts the electric motor 26, which operates the pump 22. This applies hydraulic fluid under pressure to the space 16 on the pulling head 11, thus actuating the head mechanism to place a rivet, the drawbar 13 being retracted against the urging of spring 17. When the rivet has been placed, the operator releases the force on the trigger 31. The sequence of movements described above is reversed. Firstly the sleeve 45 descends, allowing the switch 34 to turn off and stop the pump 28. Then the valve member 39 is allowed to move away from the inlet part 42, thus allowing hydraulic fluid to be ejected from the head cylinder space 16 by piston 14 under the urging of spring 17, and into the reservoir 23. The piston 14, drawbar 13 and the riveting head are thus returned to their initial positions by the spring 17, and not by the electric motor 26. Thus the electric motor, in use, rotates in only one direction. The valve 29 returns to its rest position illustrated in Figure 4A.

It is found that a battery-operated hand-held riveting tool as described above is substantially more efficient than the prior art tool referred to in the preamble due to the conversion of rotary motion to linear motion by hydraulic means instead of mechanical means, and the use of a uni-directional electric motor, i.e. one which is electrically actuated so as to rotate in only one direction, i.e. to actuate the riveting head, but not to return the riveting head its initial position.

The invention is not restricted to the details of the foregoing example. For instance, it could be applied to a tool for a form of riveting, other than blind breakstem riveting, e.g. blind repetition pull-through riveting, the installation of threaded inserts, or self-piercing riveting.

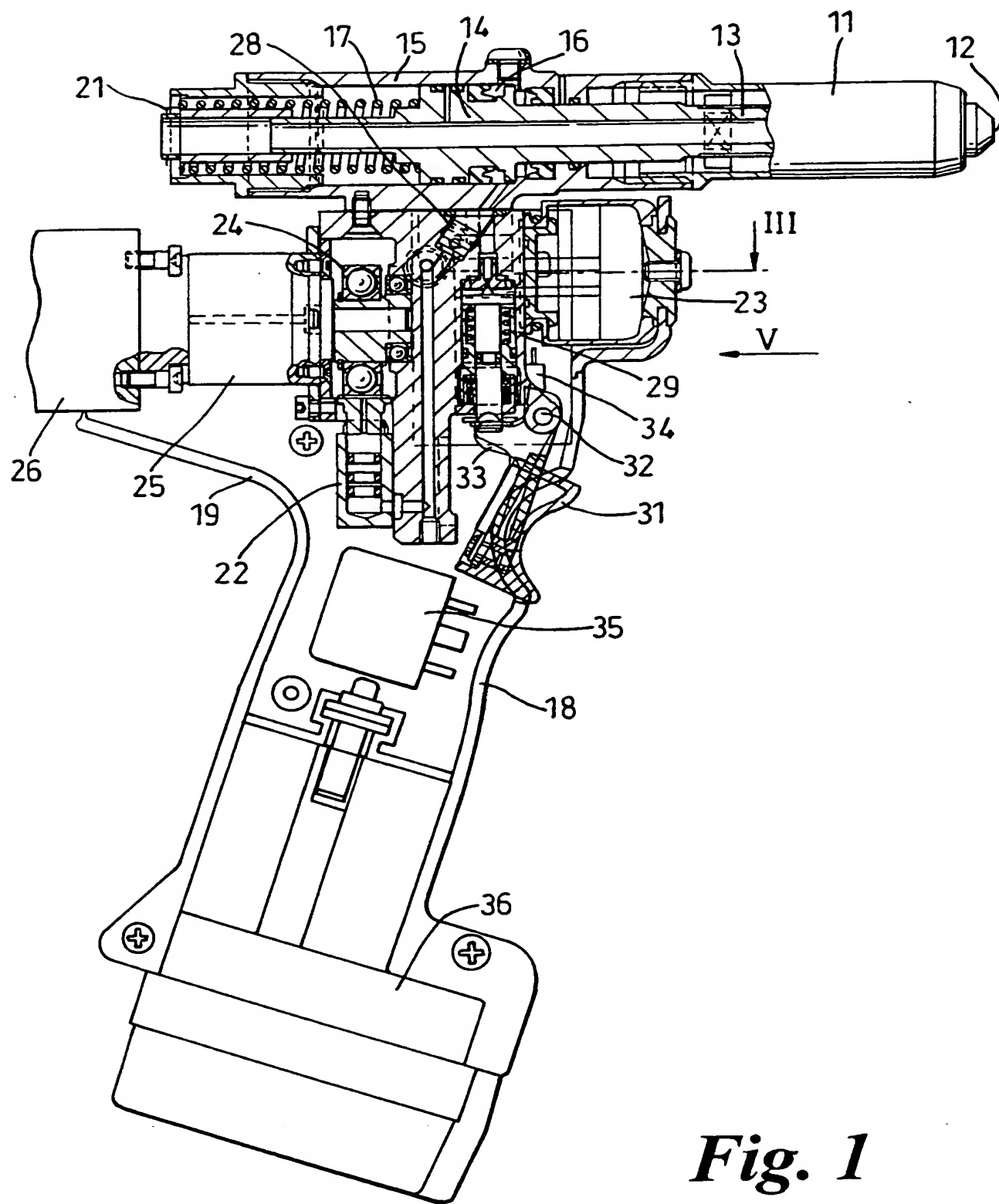
CLAIMS

1. A hand-held riveting tool driven by a battery-powered electric motor,
5 comprising a hydraulically-actuated riveting head, and a hydraulic pump
driven by the electric motor, whereby when the motor is operated it drives the
hydraulic pump to actuate the riveting head.
2. A riveting tool as claimed in claim 1, including a tool-actuating device such
as a trigger, and also including a reservoir for hydraulic fluid, the hydraulic
10 supply line from the pump to the riveting head being connected to the
reservoir by a reservoir inlet valve which is normally open to allow hydraulic
fluid to flow from the supply line into the reservoir, in which operation of the
tool-actuating device firstly closes the reservoir inlet valve, and then switches
on the electric motor to operate the pump.
- 15 3. A riveting tool as claimed in claim 2, in which release of the tool-actuating
device firstly switches off the electric motor to stop operation of the pump,
and then opens the reservoir inlet valve.
4. A riveting tool as claimed in claim 2 or claim 3, in which the reservoir inlet
valve when closed by operation of the tool-actuating device as aforesaid also
20 acts as a pressure-relief valve to relieve over-pressure of hydraulic fluid.
5. A riveting tool as claimed in claim 4 in which the reservoir inlet valve is
urged closed by a first spring with a first predetermined force and is urged
open by a second spring with a second predetermined force, operation of the
tool-actuating device removing the action of the second predetermined force,

whereby the valve is thereafter held closed by the first predetermined force regardless of sustained operation of the tool-actuating device, thereby to provide a predetermined pressure at which the valve acts as a pressure relief valve as aforesaid.

- 5 6. A riveting tool as claimed in any of the preceding claims in which the riveting head is adapted to place blind breakstem rivets.
7. A riveting tool as claimed in any of the preceding claims, in which after the motor has been operated to actuate the riveting head as aforesaid and is then switched off, the riveting head is returned to its initial position by means
- 10 independent of the head actuating means.
8. A riveting tool as claimed in claim 7, in which the head is returned to its initial position by means of a spring.
9. A riveting tool as claimed in any of the preceding claims, in which the electric motor, in use, rotates in only one direction.
- 15 10. A riveting tool as claimed in any of the preceding claims, in which the hydraulic pump is a reciprocating pump.
11. A hand-held riveting tool, substantially as hereinbefore described with reference to, and illustrated in, the accompanying drawings.

1/5

*Fig. 1*

2/5

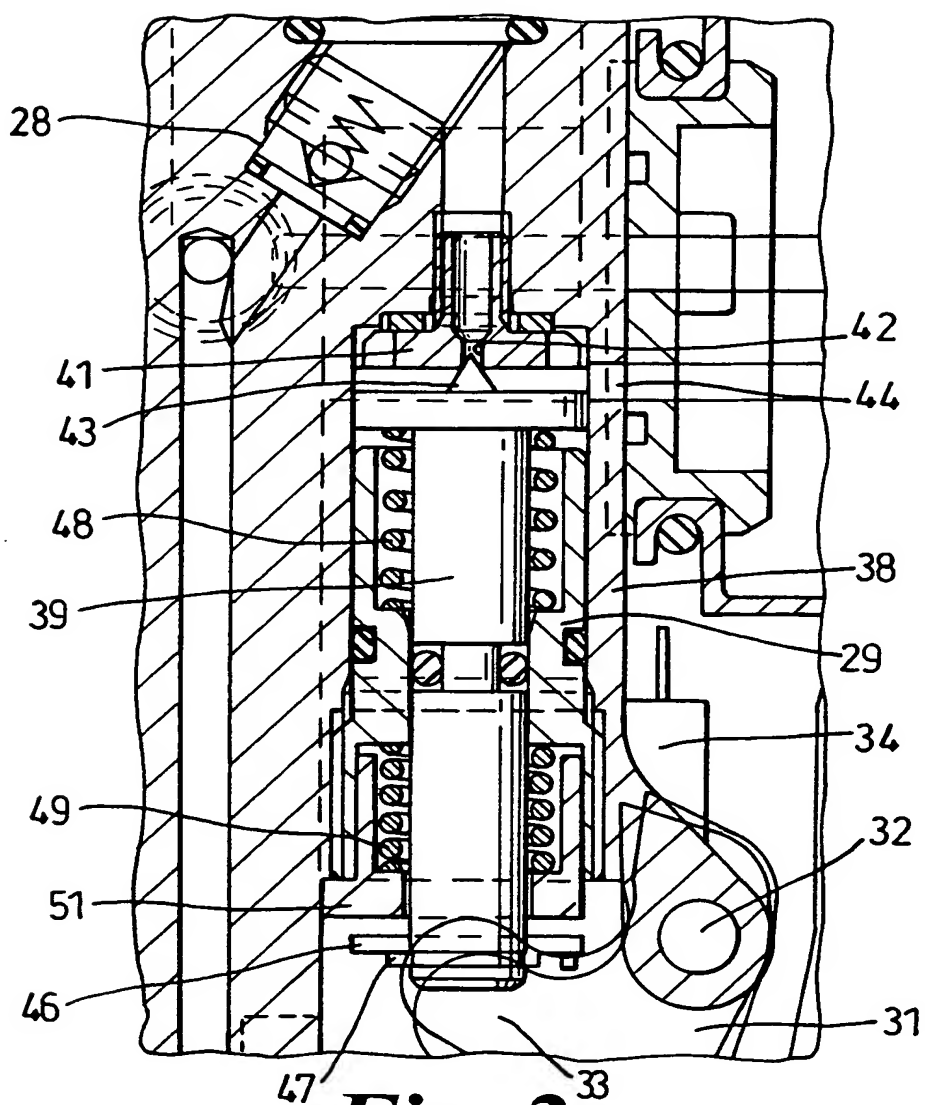


Fig. 2

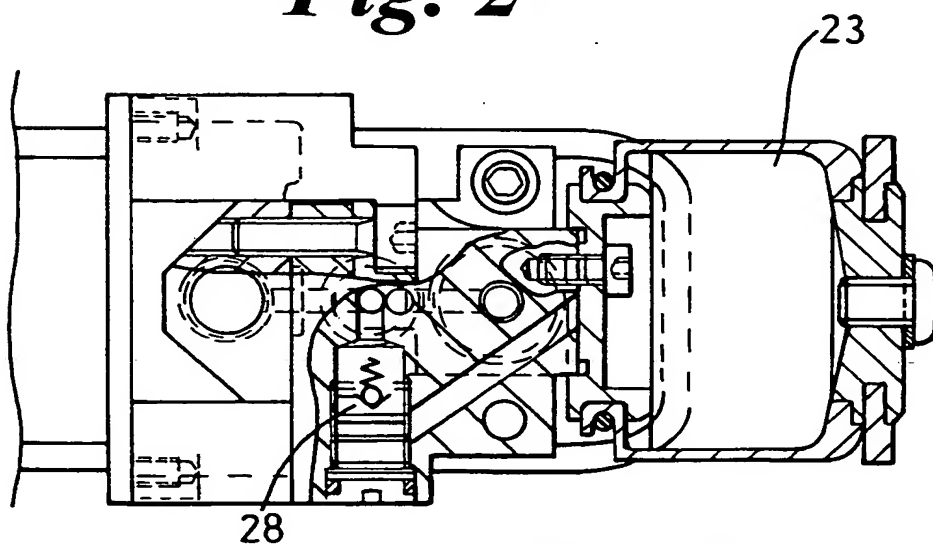


Fig 3

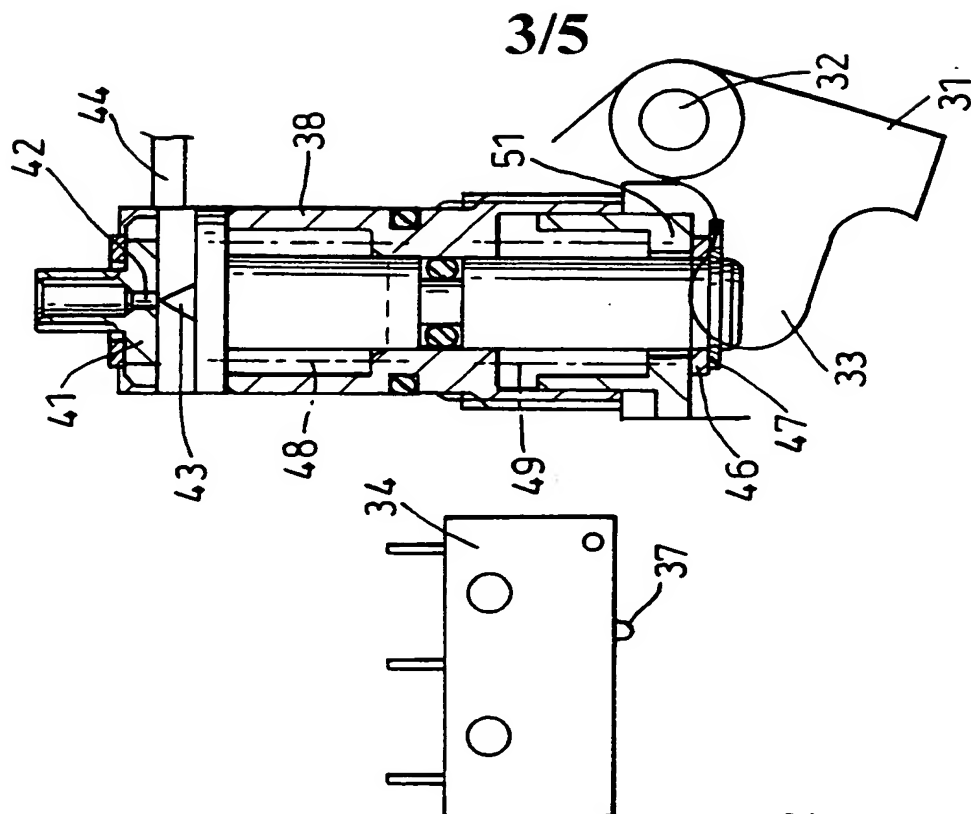


Fig. 4A

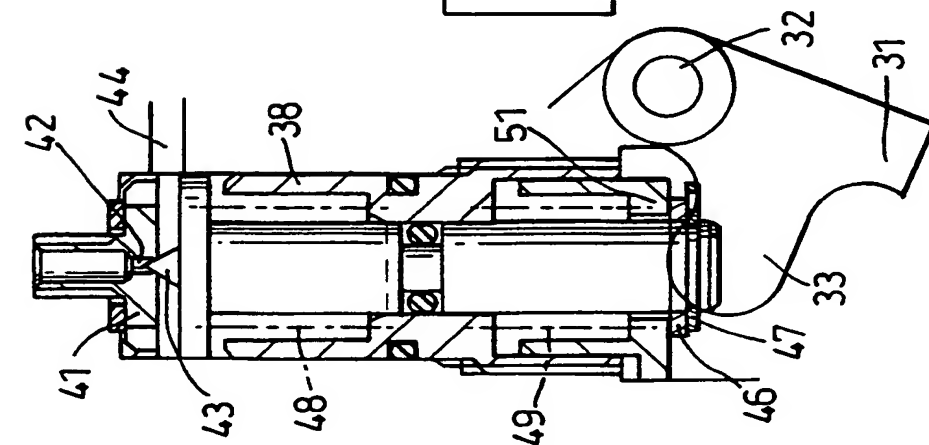


Fig. 4B

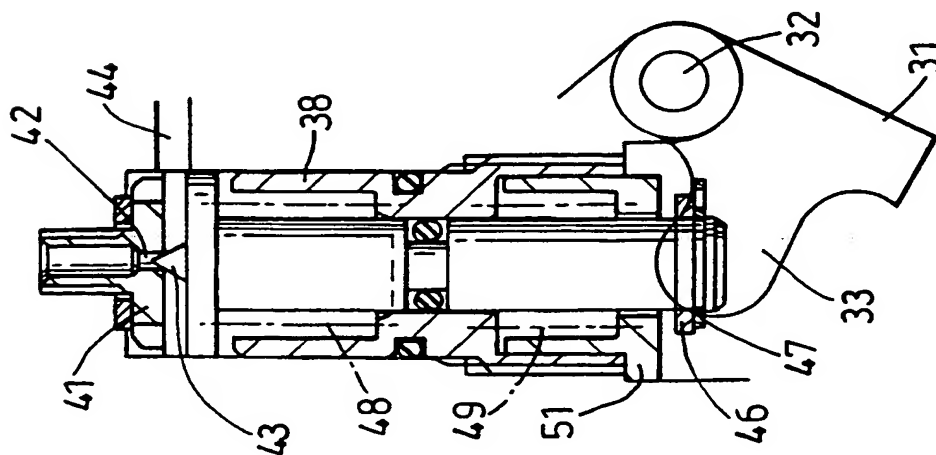


Fig. 4C

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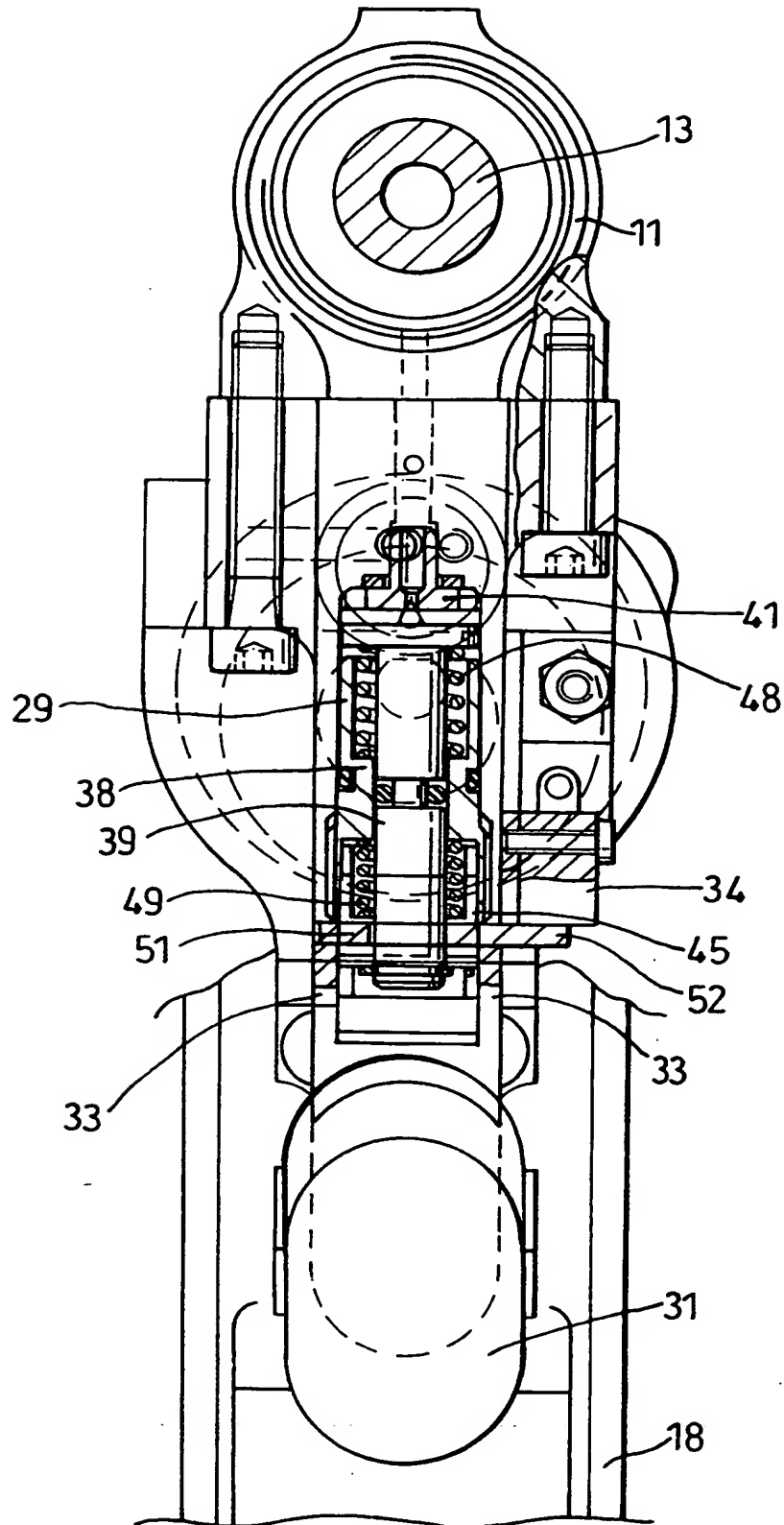
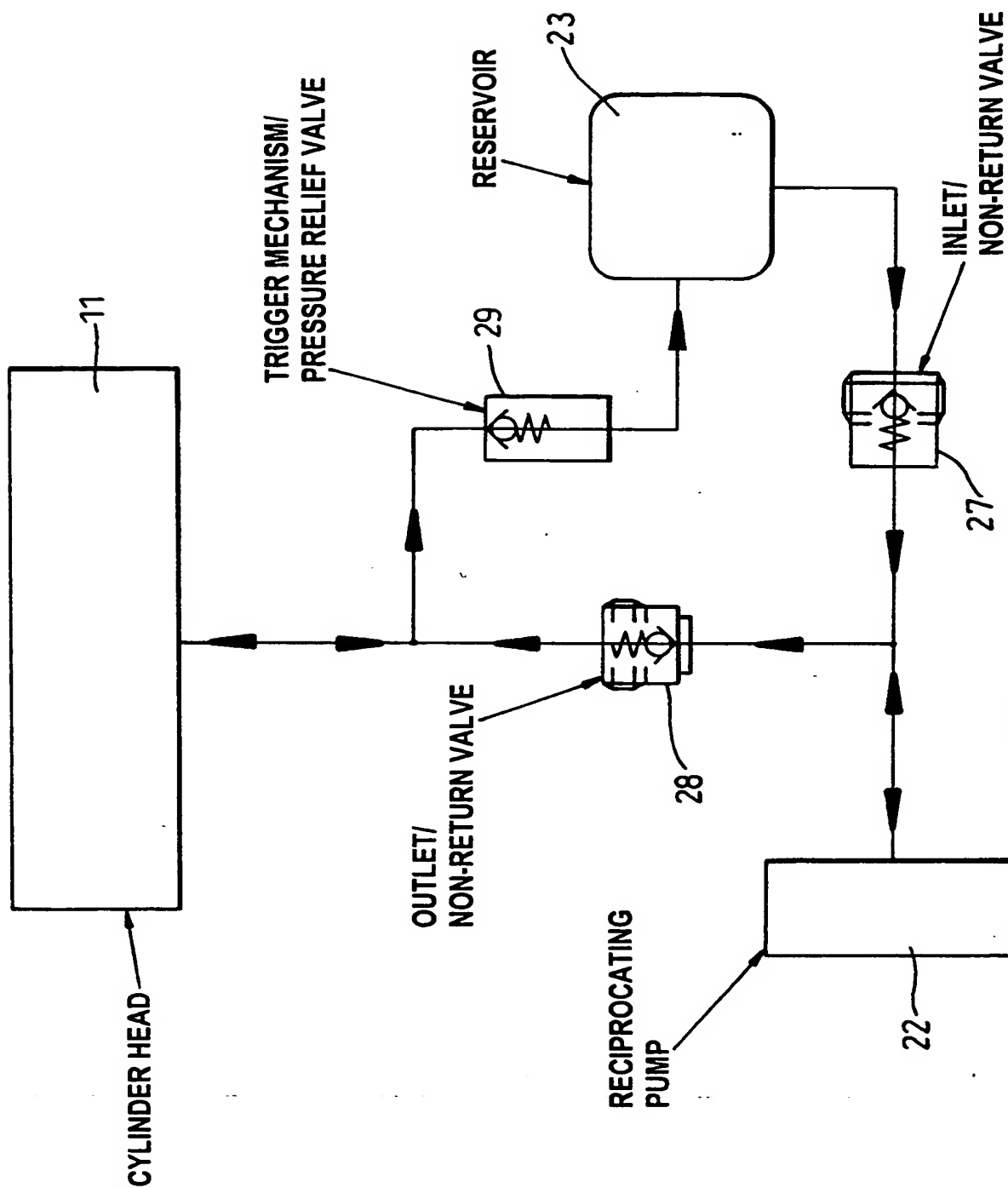


Fig. 5

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*Fig 6*